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http://gsics.wmo.int *George Ohring, Editor*

Science and Implementation Update

SUOMI NPP/JPSS INFRARED SOUNDER (CRIS): INTERCALIBRATION WITH AIRS, IASI, AND VIIRS

A key part of the Calibration/Validation efforts for the Cross-track Infrared Sounder (CrIS) on Suomi-NPP is intercalibration with the Atmospheric Infrared Sounder (AIRS) on EOS Aqua and the Infrared Atmospheric Interferometer Sounder (IASI) on METOP-A. The spectral and radiometric accuracy goals of CrIS are very challenging, and these in-orbit comparisons provide one way to assess accuracy on the order of 0.2 K brightness temperature. Comparisons with the collocated imager on Suomi-NPP, VIIRS, are also mutually beneficial for assessing the calibration of both CrIS and VIIRS. Example results are presented.

CRIS/AIRS INTERCOMPARISONS

CrIS/AIRS comparisons have been very useful in the first year of Suomi-NPP due to the large yield resulting from similar orbits of Suomi-NPP and Aqua, and because a large number of validation studies have been performed to date on the AIRS data making it a known quantity for evaluating the more recent CrIS measurements. The intercomparison technique involves collecting the observations from all CrIS and AIRS FOVs found within 100 km of the Simultaneous Nadir Overpass (SNO) locations that occur with +/- 20 minute simultaneity. For each such case, the mean and standard deviation of the radiance spectra are recorded for both CrIS and AIRS. The biases between the two instruments are computed from a weighted mean difference between the two sensors, using the spatial variability of each SNO to provide the weights. The uncertainty in the weighted mean differences is also computed. This is done independently for each spectral channel after performing spectral manipulations to account (as much as possible) for the differences in the spectral responses of CrIS and AIRS.

Because Suomi-NPP and EOS Aqua are in similar orbits, there are many SNOs distributed over a wide range of latitude and longitude. Example comparisons are shown in Figure 1 for SNOs collected between 25 Feb and 18 Dec 2012, and for view angles less than or equal to 30 degrees and CrIS/AIRS view angle differences less than 3 degrees (i.e., not just pure nadir cases). The figure shows brightness temperature differences for representative wavenumber regions in the three CrIS spectral bands. The mean differences are very small and exhibit very little variation with time. Some dependence on scene brightness temperature is observed for some wavenumber regions, and the root cause(s) is a topic of on-going investigations.

AIRS/CRIS Brightness Temperature Differences

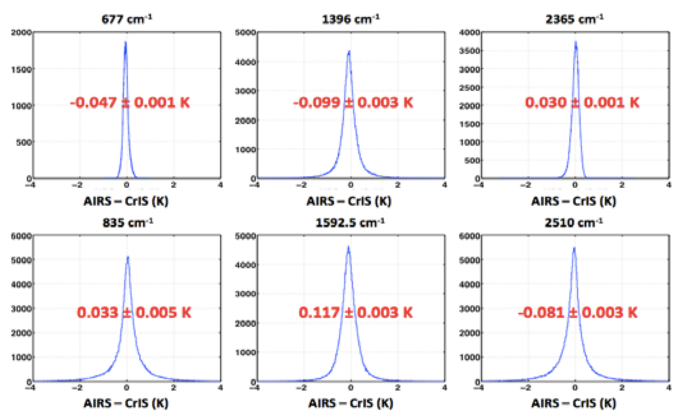

Figure 1. *Distributions of AIRS/CrIS brightness temperature differences, with mean differences and uncertainties in the mean listed in red.*

CRIS/IASI INTERCOMPARISONS

The same basic methodology described for comparing CrIS and AIRS is also used for comparing CrIS and IASI. However, due to different orbits the CrIS/IASI collocations only occur at high latitudes, and here only nadir cases are presented. Additionally, because the spectral resolution differences of CrIS and IASI can be rigorously accounted for, the comparisons are shown here for the complete spectrum of

CrIS. Using Northern Hemisphere SNOs collected between March and November 2012, the weighted mean CrIS/IASI differences and uncertainties are shown in Figure 2. Similar results are obtained for the Southern SNOs. The overall agreement between CrIS and IASI is very good – less than a few tenths K for the large majority of channels. These comparisons use a Hamming apodization to suppress a known artifact in the current CrIS products – an additional spectral ringing (Gibbs effect) in the CrIS spectra. This is a topic of current investigation by the CrIS Cal/Val team.

CRIS/IASI Brightness Temperature Differences

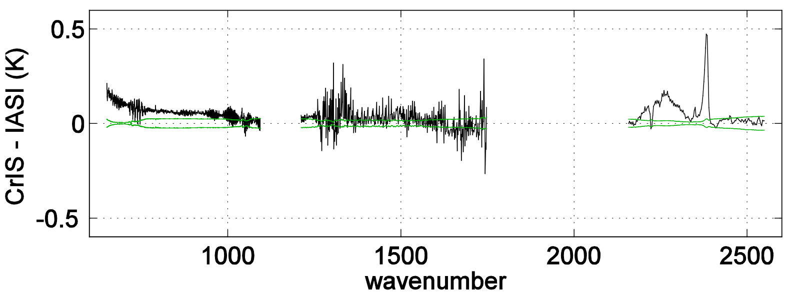

Figure 2. *Weighted mean differences (black) and uncertainty limits (green) for Northern CrIS/IASI SNOs*

CRIS/VIIRS INTERCOMPARISONS

Here we present results of intercomparing CrIS and VIIRS on Suomi-NPP. Using VIIRS bands where CrIS provides spectral coverage, the comparisons are computed for VIIRS bands M13 (4 µm), M15 (10.8 µm), and M16 (12 µm). It should be noted, however, that VIIRS bands M15 and M16 SRFs include an out-of-band (OOB) contribution in the gap in the CrIS spectra at ~9 µm.

The time series of daily mean differences between CrIS and VIIRS from February 2012 to April 2013 is shown in Figure 3. This includes the early checkout phase of both VIIRS and CrIS and therefore various discontinuities are seen, including an adjustment to the VIIRS blackbody temperature knowledge in March 2012, as well as expected artifacts due to VIIRS nonlinearity tests performed quarterly. The main result, however, is that since April 2012, the mean differences are less than 0.1 K and are very stable with time.

CRIS/VIIRS Brightness Temperature Differences

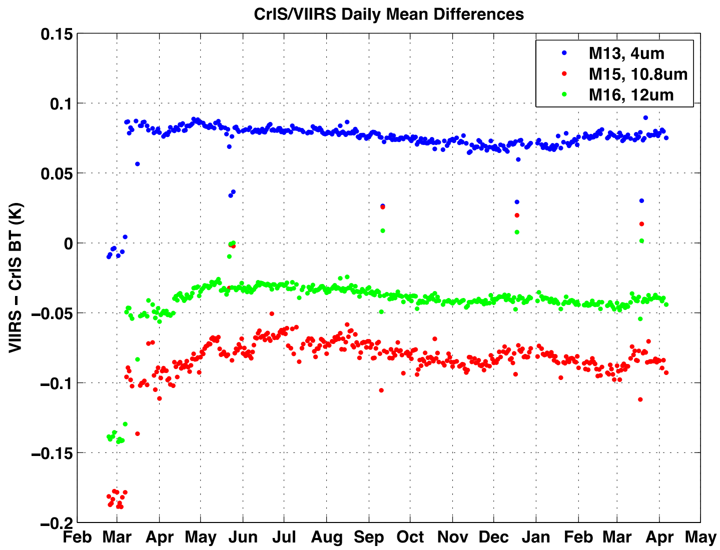

Figure 3. *Time dependence of daily mean CrIS/VIIRS differences.*

(By D. C. Tobin, Univ. Wisconsin)

Spectral Response Functions and Simulation Data of Advanced Himawari Imager (AHI) on Himawari-8

The Japan Meteorological Agency (JMA) has operated the GMS and MTSAT series of geostationary satellites at around 140 degrees east to cover the East Asia and Western Pacific regions since 1977, and makes related contributions to the WMO's World Weather Watch (WWW) Programme. As a follow-on to the MTSAT series, the Agency plans to operate next-generation satellites called Himawari-8 and Himawari-9 (himawari means "sunflower" in Japanese).

In order to provide continuity of geostationary satellite observations, JMA plans to launch Himawari-8 in 2014 and begin its operation in 2015. To ensure the robustness of the satellite observation system, Himawari-9 will be launched shortly thereafter, in 2016. JMA will continue to operate Himawari-8 and -9 at around 140 degrees east covering the East Asia and Western Pacific regions.

Himawari-8 and -9 will carry a new instrument called the Advanced Himawari Imager (AHI). AHI has capabilities comparable to those of the ABI imager, which will fly on NOAA's GOES-R, also scheduled for launch in 2015. The functions and specifications are significantly enhanced from those of the MTSAT imager. AHI will capture full disk images every 10 minutes and regional images around Japan every 2.5 minutes. AHI has 16 observing bands as shown in Table 1. Figure 1 shows the "estimated" SRFs (Spectral Response Functions) of AHI as of June 2012. Color earth images will be derived by compositing three visible channels (blue: 0.46 µm, green: 0.51 µm, red: 0.64 µm). The SRF data are available on the MSC (Meteorological Satellite Center) website: http://mscweb.kishou.go.jp.

Table 1. Imager specification of Himawari-8/9 and MTSAT-1R/2. Spatial resolution is horizontal resolution of imager at nadir point. Wavelength is the central wavelength of Himawari-8/9.

Central wavelength (µm)	Himawari-8/9	MTSAT-1R/2
	Spatial resolution (km)	
0.46	1	
0.51	1	
0.64	0.5	1
0.86	1	
1.6	2	
2.3	2	
3.9	2	4
6.2	2	4
7.0	2	
7.3	2	
8.6	2	
9.6	2	
10.4	2	
11.2	2	4
12.3	2	4
13.3	2	

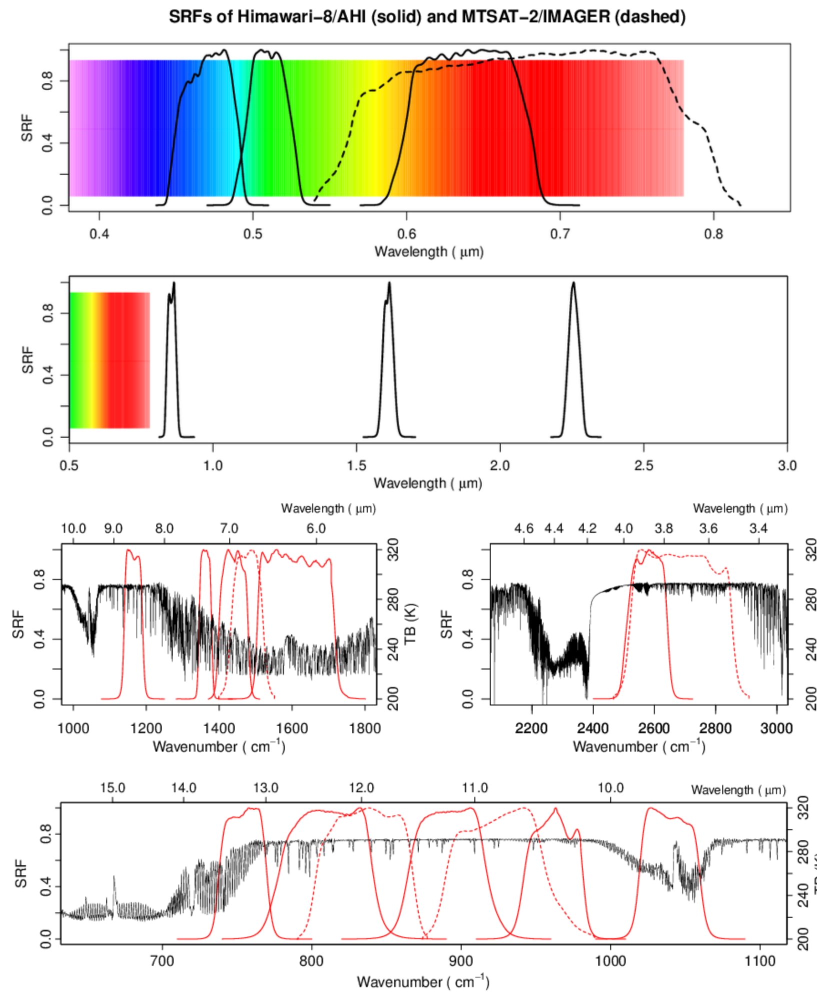

Figure 1. SRFs of AHI on Himawari-8 and Imager on MTSAT-2. Solid and dashed curves are SRFs of AHI and Imager, respectively. Black lines in the infrared figures represent the brightness temperatures of the up-welling radiances at the top of the atmosphere simulated by the radiative transfer model LBLRTM with the HITRAN2000 (AER updates) line parameters with respect to the U.S. standard atmosphere. RGB spectra in the visible/near-infrared figures are generated by the program on http://www.physics.sfasu.edu/astro/color/spectra.html.

To support research and development for Himawari-8/9 analysis products, simulation-based proxy data have been created. Since February 2013, the data have been made public online for use in AHI research and development during the pre-launch phase. Figure 2 shows an example of simulations of observations from AHI's 16-bands. These data are generated from radiative transfer calculations using the visible vicarious calibration techniques (Kosaka and Okuyama, 2012) developed in collaborative research with the University of Tokyo. For this purpose, the radiative transfer model RSTAR (Nakajima and Tanaka, 1986) is used. Analysis and forecasts from JMA's numerical weather prediction data are adopted as atmospheric fields. To determine surface conditions, a MODIS product provided by NASA is used. For atmospheric composition, climate conditions are currently adopted. JMA plans to apply this radiative transfer simulation technique to validating the calibration of AHI's visible and near-infrared channels.

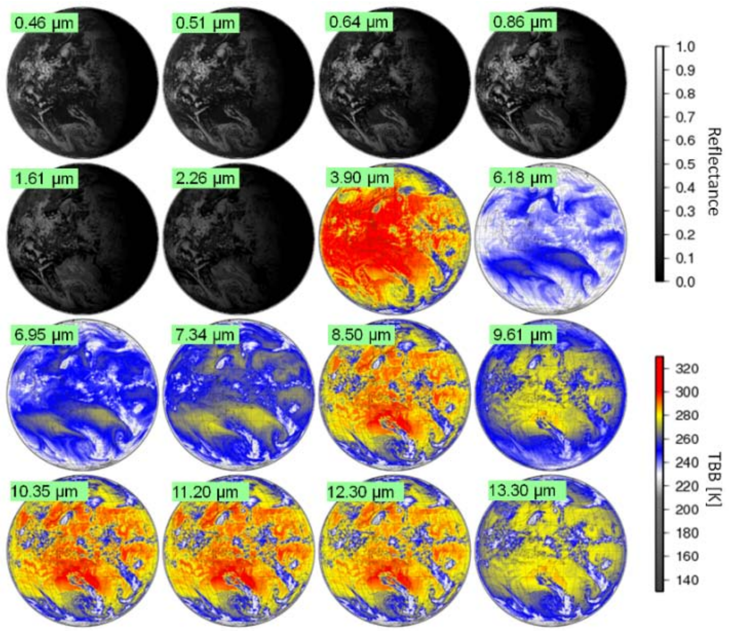

Figure 2. *Simulated images for Himawari-8/9's 16 AHI bands based on the radiative transfer model RSTAR.*

Acknowledgements

JMA is grateful to the staff of the OpenCLASTR project for providing the Rstar6b package used in this work.

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(By Masaya Takahashi, JMA)

Correction of Bias in AVHRR Time Series Data

Systematic error in long-term satellite data records resulting from sensor drift, inter-sensor differences or other persistent influences such as satellite orbital drift can greatly affect the use of these data to monitor land surface dynamics and trends. The research presented here was motivated by the need to evaluate the Canada Centre for Remote Sensing (CCRS) Long Term Satellite Data Records (LTSDR) described in Latifovic et al. (2005) and correct for systematic error.

The evaluation and correction of the CCRS AVHRR time series for systematic error was performed in two phases. In the first phase, simultaneous nadir overpasses (SNO) were used to initially quantify inter-sensor differences, but due to limitations in SNO sampling a second optimization step was included based on evaluation of a single reference calibration target. To validate the effectiveness of the approach, a set of additional pseudo-invariant targets were used.

The results of the cross-sensor SNO analysis are given in Figure 1 on the following page. All measurements were normalized to NOAA-19 which served as the reference sensor. For AVHRR-2 type sensors (those prior to NOAA-16), only NOAA-14 could be compared to NOAA-16, as there is a gap in the AVHRR data record between NOAA-14 and NOAA-11. NOAA -9 and NOAA-11 overlap but were not compared because differences in spectral response functions between the sensors in visible and NIR reflectance are less than 1% (Trishchenko et al., 2002). Further, both sensors have benefited from numerous calibration studies and are expected to be sufficiently cross-calibrated for the reference calibration target optimization step described below. NOAA-16 and -17 were compared using SNO observations acquired between 2002 and 2005. Operational calibration monthly updates for NOAA-17 became available from NESDIS on June 8, 2004. Before this, pre-launch coefficients were used. For the period of pre-launch calibration prior to June 2004, NOAA-17 visible reflectance was higher, up to 1.6%, and NIR lower, down to -5.6%, compared to NOAA-16 reflectance. After including the NOAA-17 post-launch vicarious calibration update the difference in NIR for SNO overpasses from 2005 on was positively biased with respect to NOAA-16 by 4%. The NESDIS post-launch coefficients appear correct as evaluation of NOAA-17 and -18 using SNO observations acquired during 2007 show good agreement. The cross-sensor comparison for NOAA-17 versus -18 and NOAA-18 versus-19 showed only a small average difference in the visible and NIR bands of around 1%.

In general the analysis shows overall higher consistency between measurements acquired by satellites carrying AVHRR-3 (mean difference close to 0) than those carrying AVHRR-2 sensors. This higher data consistency was

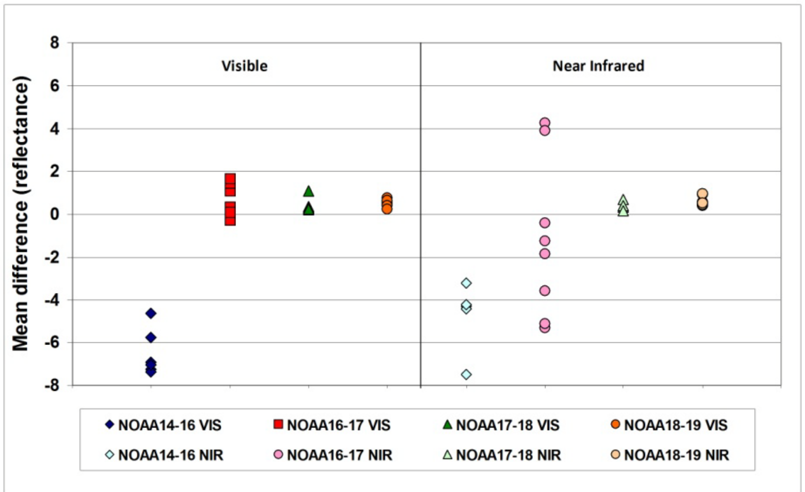

***Figure 1**. SNO based cross sensor comparisons. Each point in the graph represents the mean reflectance difference from ~100-200 pixel pairs for a SNO.*

achieved not only because they were equipped with the same AVHRR-3 sensor, but also because the calibration coefficients provided by NESDIS for each mission are based on the same calibration targets in the Libyan Desert, the overlap between observations is more frequent, and the orbital drift was not as strong as in the case of AVHRR-2 sensors.

The SNO based cross-sensor correction coefficients were evaluated using the grassland reference calibration target specified in Teillet et al. (2010). Values from a time series of the reference target for the period 1985-2011 were generated as average values of visible and NIR bands from 10-day sun-sensor geometry normalized surface reflectance. A large bias was observed for the visible and NIR measurements between the AVHRR-2 sensors and the AVHRR-3 sensors. This is explained in part by the differences in sensor bandwidth, band central wavelength and spectral response functions (SRFs); however, some of the variability between sensors is perhaps the result of imperfect sensor calibration or other data and processing algorithm deficiencies. The final set of cross sensor normalization coefficients based on the SNO and the reference calibration target is presented in Table 1.

Table 1. Cross-sensor normalization coefficients

	VIS-Band	NIR-Band
NOAA 9-16	0.82	0.86
NOAA 11-16	0.82	0.86
NOAA 14-16	0.86	0.86
NOAA 16-17	1.00	1.01
NOAA 17-18	1.03	1.01
NOAA 18-19	1.03	1.02

The correction approach was validated based on a statistical analysis of eight pseudo-invariant targets (PTs). Figure 2 on the following page illustrates visible and NIR surface reflectance time series of one of the targets, PT-4, before and after cross-sensor normalization. Negative slopes are evident in all PTs before applying cross-sensor correction due to higher reflectance in both visible and NIR bands measured by AVHRR 2 compared to AVHRR 3 sensors. The analysis of the pseudo-invariant targets confirm the SNO-calibration target results and provide confidence in the derived correction coefficients, as it is shown to be effective across Canada for a range of target types. The approach developed provides an effective way to assess and correct satellite time series for systematic error with a high statistical confidence by ensuring that both the SNO and pseudo-invariant targets are in good agreement. Furthermore, it is sufficiently generic to be used for long time series analysis where sensor design may change and time gaps may exist in the data record.

The complete paper upon which this note is based appears in the journal *Remote Sensing of Environment* (Latofovik et al., 2012).

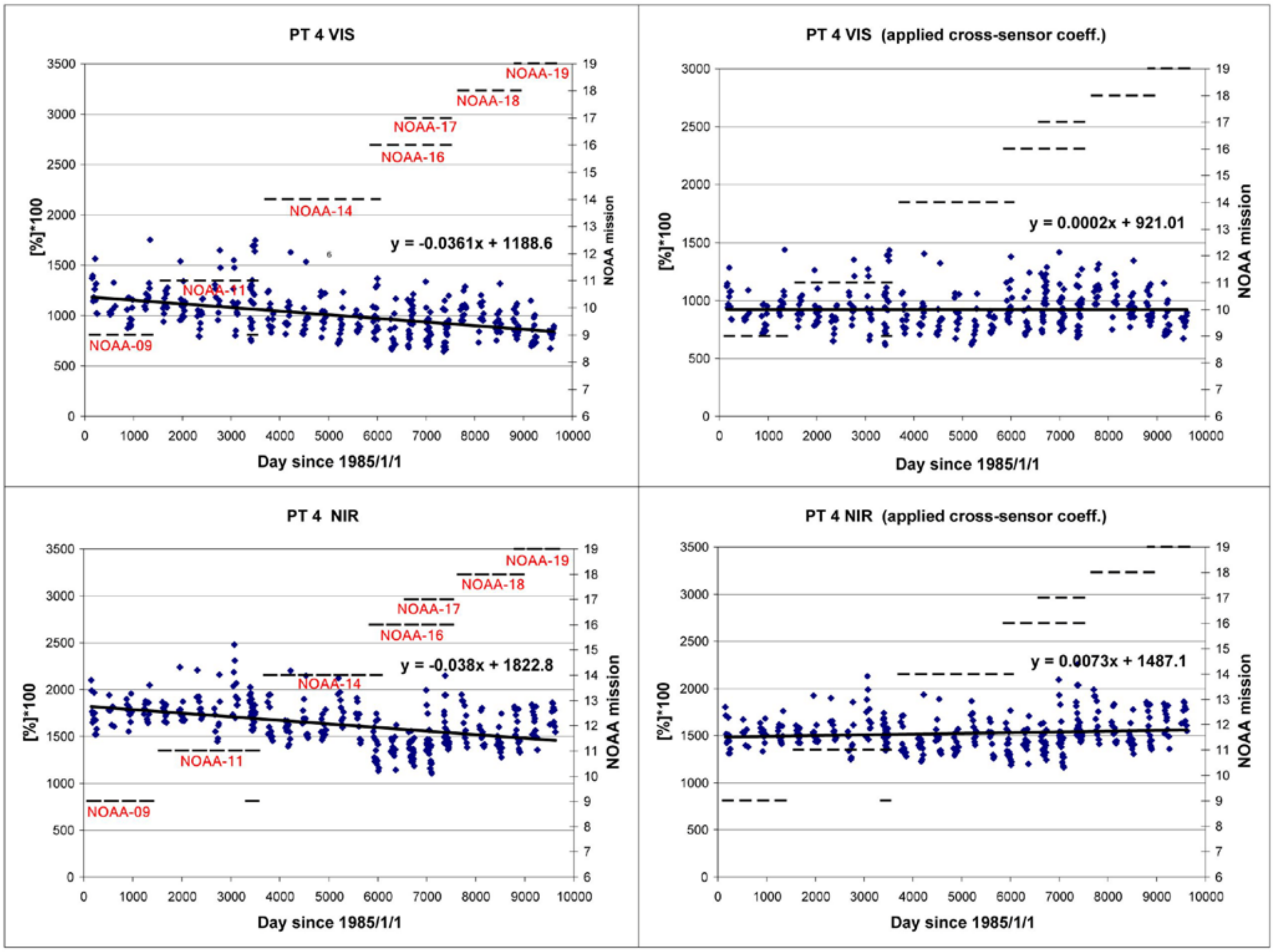

***Figure 2**. 1985-2011 AVHRR time series for the surface reflectance in the visible and NIR bands for a grassland pseudo-invariant target before (left panels) and after (right panels) cross-sensor correction (dashed lines correspond to observational time periods of the different AVHRR instruments).*

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(By Rasim Latifovic and Darren Pouliot, NRCan/CCRS)

Other News

GSICS Data and Research Working Groups Meeting

Participants of the 2013 GSICS Data and Research Working Groups Meeting, Williamsburg, Virginia, USA, 4-8 March

The 2013 Annual Meeting of the GSICS Data and Research Working Groups took place in Williamsburg, Virginia, USA, on 4-8 March. For the first time, a mini conference to present the latest updates on activities of interest to GSICS was held the day before the start of the Meeting. This was dominated by results from the cal/val of instruments on Suomi/NPP and the host's (NASA) development of the CLARREO concept, which is particularly important to GSICS as it would provide a climate quality inter-calibration reference instrument, which is directly traceable to SI standards.

The Research Working Group initially focused on the steps necessary to advance to operational status the current GSICS products to inter-calibrate the IR channels of current geostationary imagers (GEO-LEO IR) to IASI. Ways to extend these products to more GEOs and transfer from one reference instrument to another were also discussed. The group then turned its attention to the inter-calibration of GEO channels in the reflected solar band. We planned a series of milestones to develop prototype GSICS products, initially using deep convective clouds to transfer the calibration from the MODIS reference. This method will then be extended to apply to LEO instruments and combined with results using clear ocean targets (Rayleigh scattering) and/or lunar observations to cover the monitored instruments' full dynamic range.

The Data Working Group discussed the underlying technologies that support current and future capabilities. The WG is planning to prepare a tutorial on data access.

All presentations are available online at https://gsics.nesdis.noaa.gov/wiki/Development/20130304

(Tim Hewison, EUMETSAT, and Aleksander Jelanek, NESDIS)

2013 GSICS Users' Workshop

Mitch Goldberg, Chair, GSICS Executive Panel, addresses the workshop

The 2013 GSICS Users' Workshop was hosted by NOAA/NESDIS/STAR at NOAA's new National Center for Weather and Climate Prediction in College Park, Maryland, USA on 8 April, in conjunction with the first NOAA Satellite Conference. More than 60 people from about 15 agencies, universities, and private companies attended the workshop. A total of 14 oral talks, together with 10 posters, were presented, covering topics such as GSICS strategy, product development and data management, current and planned instrument inter-calibrations, and feedback on and requests for GSICS products. Users demonstrated successful applications of GSICS spectral response function corrections to increase the GOES Imager data quality and showed examples of GSICS correction products to improve GOES Sounder and MTSAT products. With the expected delivery of retro-processing data, users plan to continue the investigation of the impacts of the GSICS Correction on the Level 2 and Level 3 products. It is expected that the GSICS inter-calibrations will play an important role in the GOES-R on-orbit cal/val project. Reacting to the GOES-15 Imager calibration anomaly event in March 2012, users expressed the need for a satellite operational anomaly alert system for the GOES-R series. It was also recommended that two new GSICS sub-groups, ultraviolet (UV) and synthetic observation, added to the restructured GRWG subgroups to better understand UV instrument calibration and radiative simulation performance. During the off-line discussion, the users also expressed an interest for the intermediate datasets. All the workshop reports are available at the GSICS wiki 2013 users' workshop webpage: https://gsics.nesdis.noaa.gov/wiki/Development/UsersWorkshop2013.

(Fangfang Yu, NESDIS, and Tim Hewison, EUMETSAT))

Special Issue of Transactions on Geoscience and Remote Sensing (TGRS)

GSICS members were heavily involved in putting together a special issue of the Institute of Electrical and Electronics Engineers (IEEE) journal Transactions on Geoscience and Remote Sensing (TGRS) on the "Inter-Calibration of Satellite Instruments". They wrote, revised and reviewed papers for the issue, which was published in March 2013 and is now available online through the IEEE Xplore website.

Cover of the Special Issue

Remote sensing satellites must provide accurate and consistent measurements over time so that changes in Earth's environment can be detected and quantified. The papers published in this issue address intercalibration of various satellite instruments and the importance of robust ongoing calibration, validation, stability monitoring, and quality assurance. The goal of this special publication is to capture the state-of-the-art methodologies and results from intercalibration of satellite instruments, including full end-to-end uncertainty analysis. It includes 40 papers, including authors from CMA, CNES, ESA, EUMETSAT, ISRO, JAXA, KMA, JMA, NASA, NOAA and USGS, covering a broad range of the electromagnetic spectrum from the microwave to the ultraviolet. This 800-page special issue will become a reference anthology for the remote sensing community. The issue is available online at: http://ieeexplore.ieee.org/xpl/tocresult.jsp?isnumber=6469257&punumber=36 . Many of the papers are being published with Open Access (thanks to WMO for providing funding), so you can download them freely. Just click on the pdf link for those atricles labeled "free" or "open access."

(Gyanesh Chander, USGS, and Tim Hewison, EUMETSAT)

GSICS Profiles

(Editor's note: With this issue of the Quarterly Newsletter we begin an occasional series of profiles of people associated with GSICS.)

Meet Fangfang Yu

Fangfang probably needs no introduction to many of our readers. She joined the GSICS community in 2009 and her research has focused on GSICS GEO-LEO inter-calibrations. In 2011, she was appointed Deputy Director of GSICS Coordination Center (GCC). The GCC, under the direction of Dr. Fuzhong Weng, coordinates GSICS product development and the activities of the GSICS Working Groups, supports end-to-end demonstration projects, updates the GSICS Operations Plan, maintains communications and outreach programs, and supports the GSICS Executive Panel.

As Deputy Director, Fangfang has facilitated communications between GSICS and its user communities and within the GSICS itself, provided continuous support to the GEO-LEO infrared (IR) inter-calibration baseline algorithm development and implementation at each GSICS Processing and Research Center (GPRC), edited the GSICS Quarterly (GQ) Newsletters (vol. 5-6), updated the GCC website, and tracked and promoted GSICS products following the GSICS Procedure for Product Acceptance (GPPA).

Fangfang received the B.S. and M.S. degrees from Peking University, Beijing, China in 1991 and 1994, respectively. She was awarded her Ph.D. degree from the Department of Geography, the University of Kansas, Lawrence, Kansas, USA in 2002. Fangfang has been working at the NOAA/NESDIS/Center for Satellite Applications and Research (STAR) since 2005, first supporting NOAA AVHRR and then GOES weather instrument calibration and validation. She would like to thank the GSICS participants and user communities for all their help and support to GCC.

A Note from the Executive Chair

(Editor's Note: This is the first of a series of reports from the Chair of the GSICS Executive Panel to the GSICS community that will be published as a regular feature in the Quarterly Newsletter.)

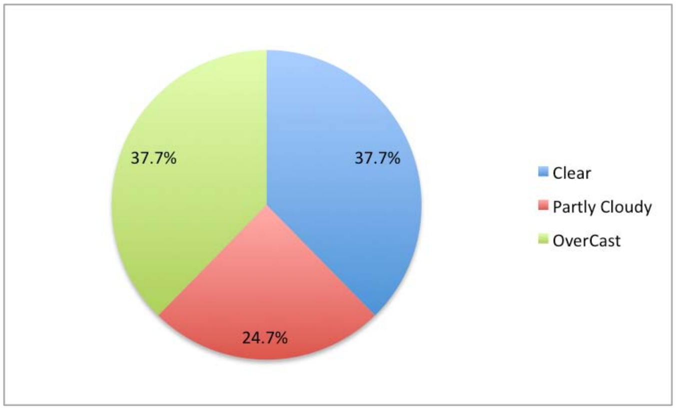
It's been over 7 years since the WMO and the Coordination Group for Meteorological Satellites (CGMS) initiated the Global Space-based Inter-Calibration System (GSICS) as an international collaborative effort to monitor, improve and harmonize the quality of observations from operational weather and environmental satellites of the Global Observing System (GOS). During the formulation stage of GSICS, critical direction and input were provided by Johannes Schmetz (EUMETSAT), Tillman Mohr (former EUMETSAT Director General and WMO consultant), Jerome Lafueille (WMO), Don Hinsman (WMO Space Director), Toshi Kurino (JMA), Raju Datla (NIST), and George Ohring (NOAA Consultant). GSICS aims at ensuring consistent accuracy among space-based observations worldwide for climate monitoring, weather forecasting, and environmental applications. I am very pleased to report on the outstanding accomplishments in capacity building of calibration and validation expertise throughout the GSICS agencies. Through GSICS, the goal is being realized for each agency to provide the best-characterized data tied to reference instruments and enabling immediate use in a variety of applications. When put into a global perspective, the GSICS is the cornerstone for accurate observations from the GOS.

We began with the WMO, NOAA, EUMETSAT, JMA, KMA, CMA, CNES, NIST and grew over time to include NASA, Roshydromet, JAXA, IMD, ISRO, USGS and ESA (as an observer). Each agency provides a representative to the Executive Panel and members for the GSICS Research and Data Working Groups. Jerome Lafueille in his role as GSICS Executive Panel Secretary has been instrumental in helping to define priorities.

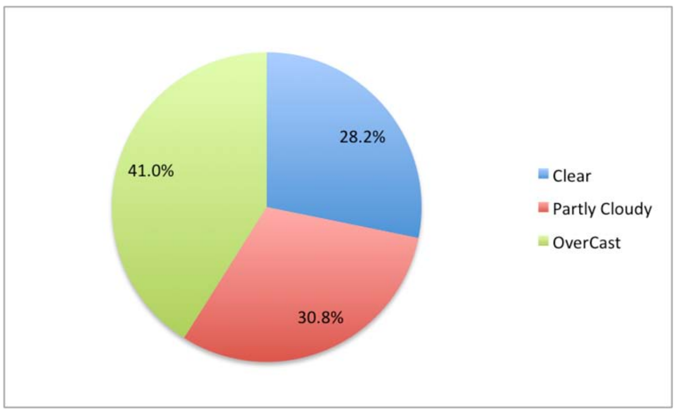
We all agreed to focus initially on our common problem of drifting calibrated geostationary infrared radiances and visible reflectances (which rely solely on vicarious calibration) of the operational satellites. IASI and AIRS became our reference instruments for the infrared measurements since detailed analyses revealed that their brightness temperatures generally agreed to within 0.1 K with no evidence of any trends in these differences. We developed common algorithms for adjusting geostationary infrared imagers to IASI and AIRS. The common algorithm provided the first GSICS correction coefficients for geostationary infrared imagers, and when applied resulted in very stable geostationary infrared time series. We found improvements in climate, weather forecasting and nowcasting applications as a consequence of these corrections. One example is shown on the following page.

The GSICS Coordination Center, hosted by NOAA, and directed by Fuzhong Weng, is the focal point for interagency cooperation. Collaboration between scientists from our different agencies is arranged through the GSICS Research Working Group – first chaired by Fred Wu (NOAA) and now by Tim Hewison (EUMETSAT).This collaboration has been further enhanced by visiting scientists between institutions, resulting in cross-pollination of scientific expertise and tools. Each agency is responsible for generating its own calibration correction coefficients and providing monitoring websites based on GSICS algorithms and standard data formats. The GSICS Product Acceptance Procedure ensures a complete Algorithm Theoretical Basis Document (ATBD) and uncertainty analysis are provided for each product. Our NIST and NASA colleagues produced the first GSICS best guidelines for prelaunch characterization of optical instruments. If adhered to by each agency, these procedures will result

Before GSICS Correction



After GSICS Correction



The number of clear, partly cloudy and overcast pixels is significantly changed for these geostationary MSG observations over Africa, with profound implications for monitoring of surface properties and cloudiness. Image credit: EUMETSAT

in much better-characterized instruments ready for launch into orbit. To ensure common datasets and access, the GSICS Data Working Group – first chaired by Volker Gardiner (EUMETSAT) and now by Aleksander Jenelak (NOAA) – developed GSICS Data Servers. I am also very proud of the hard work of Fangfang Yu and Bob Iacovazzi for their contributions to the GSICS product acceptance procedures and for editing the GSICS Quarterly Newsletter. Fangfang has recently stepped down from her position as Editor, and with this issue George Ohring has taken over.

GSICS is now working on the Correction for geostationary visible channels using various calibration techniques, including deep convective clouds, the moon, stars, and other visible imagers such as MODIS and MERIS. We are also engaged in the intercalibration of polar orbiting satellites, including the analysis of the new Suomi NPP satellite.

In March, I attended the GSICS Research Working Group meeting in Williamsburg Virginia, USA, and was quite impressed by the level of research at all the participating agencies. We recommended expanding the scope of GSICS by restructuring the GRWG to include subgroups such as microwave, all reflective solar bands (including ultraviolet), infrared, and historical instrument recalibration. In April, the fifth GSICS Users meeting, with more than 60 participants, was held at the new NOAA science facility in College Park, MD, USA, in association with the NOAA Satellite Users Conference. Short summaries of these events appear elsewhere in this Newsletter, and more complete reports will be posted soon on the GSICS website.

I would also like to thank Gyanesh Chander, Tim Hewison, Nigel Fox, Fred Wu, Jack Xiong, and Bill Blackwell for their excellent work as Guest Editors for the Special Issue of Transactions on Geoscience and Remote Sensing (TGRS) reported on elsewhere in this issue.

To conclude, GSICS remains healthy and our future role is becoming more important. Recently GSICS was recognized as a key component of the value chain for the new Global Framework for Climate Services (GFCS) that the WMO Space Programme is coordinating with the support of other international working groups such as CGMS and CEOS. I will discuss GFCS and GSICS' role in my next note.

Mitch Goldberg, Chair, GSICS Executive Panel

Just Around the Bend …

GSICS-Related Meetings

- Instrument calibration and characterization session at 2013 EUMETSAT Meteorological Satellite Conference & the 19th Satellite Meteorology, Oceanography, and Climatology Conference of the American Meteorological Society, Sept. 16-20, Vienna.

GSICS Related Publications (Compiled by EUMETSAT)

ANGAL, A. et al (2013) Multitemporal Cross-Calibration of the Terra MODIS and Landsat 7 ETM+ Reflective Solar Bands. IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING Vol. 51 No. 4 pp. 1870-1882

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Additional GSICS Related Publications

A complete list of the publications in the Special Issue of the IEEE Transactions on Geoscience and Remote Sensing (TGRS) on the "Inter-Calibration of Satellite Instruments" appears at [http://www.star.nesdis.noaa.gov/smcd/GCC/publications_ieee2013specialissue.php).](http://www.star.nesdis.noaa.gov/smcd/GCC/publications_ieee2013specialissue.php)

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